

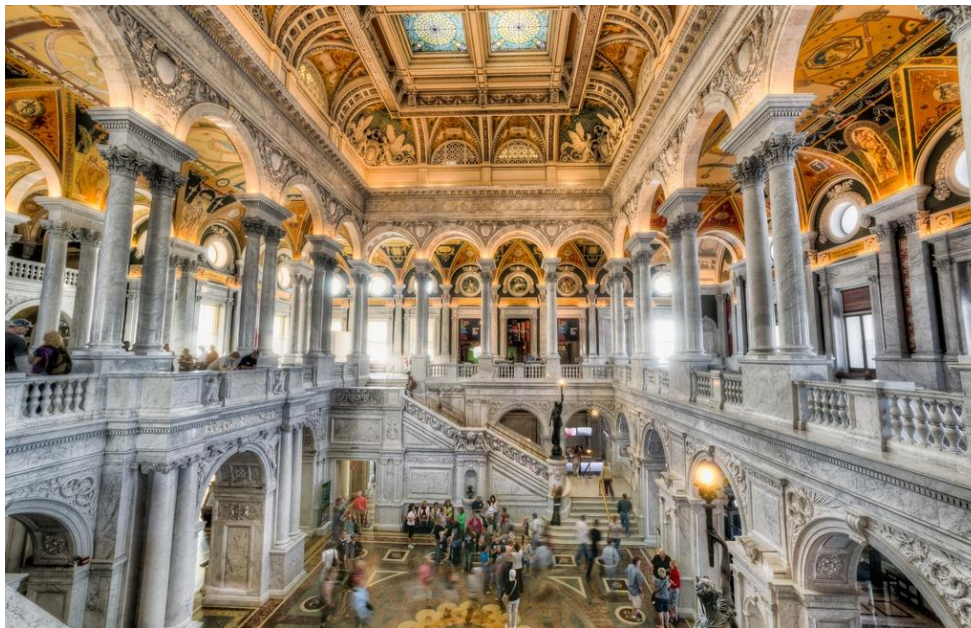
Keeping it Cool - Designing the Library's New Gutenberg Bible Display Case

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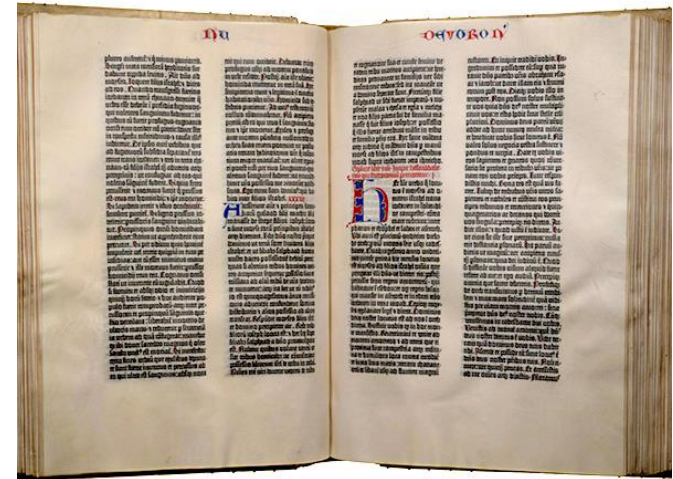
Visitor Highlights on long-term display

- **Gutenberg Bible**
Active mechanical system
- **Waldseemüller and Buell Map**
Encasements controlling oxygen content
- **Jefferson's Library**
Visible storage (book shelves)



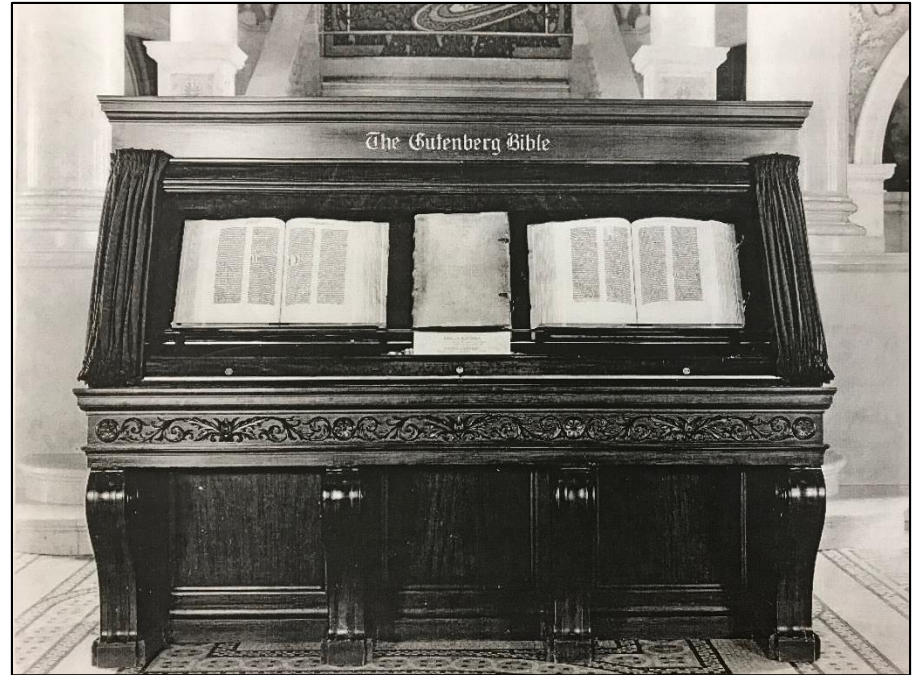
The Library of Congress Gutenberg Bible

- Gutenberg Bible was the first major book printed with movable type in the West
- The Library's copy of the Gutenberg Bible is three-volume set printed on vellum
- The set is designated as one of the Library's National Treasures
- This designation puts into effect a number of conservation and security requirements
- On a rotating schedule, one volume of the set is always on display. A page turn takes place every 3 months, a volume change occurs every 6 months.



Old Bible display case

- The original display cases were modeled after one designed Michelangelo for the Laurentian Library in Florence, Italy
- First installed in 1930s



Old display case design inspiration



Laurentian Library in Florence, Italy

Old display case - History

- **1982:** Modified to include environmental control equipment (new back part added to the case)
- **1990:** Mechanical equipment was overhauled
- **1993:** Ten-year review to assess features including climate control, fire protection, and lighting.
- **1996:** Hardening of the case and communication lines established for security and environmental monitoring.
- **2008:** Fire protection upgraded to include early warning smoke detection.
- **2012:** Original Halon 1301 fire suppression agent upgraded to FM200 to comply with current standards.



Old display case - Issues

Old case issues:

- Mechanical equipment the case is in use for 30 years.
- Various (HVAC, security, fire detection/suppression) systems updated multiple times creating a patched-together appearance
- Challenges with access to the artifact
- Newly installed sprinklers in the Great Hall
- Wear and tear to exterior
- Problems securing locks to service panels
- Non-aqueous fire suppression system

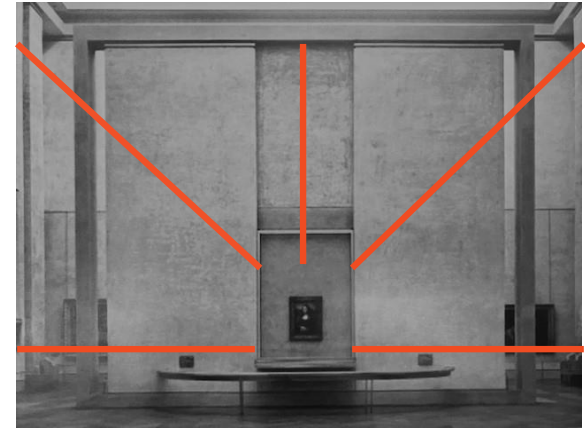


New display case – Requirements

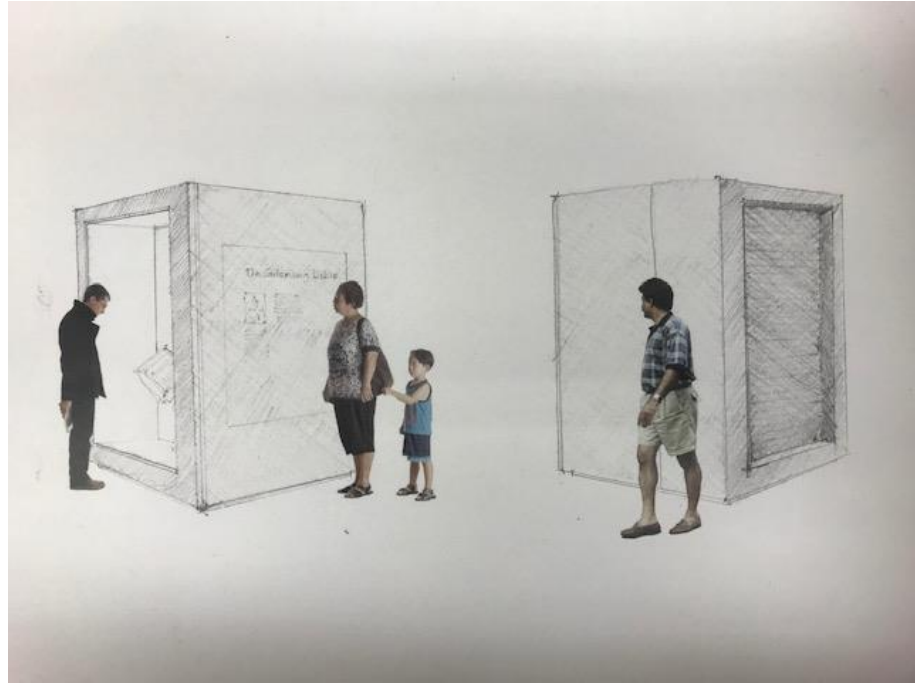
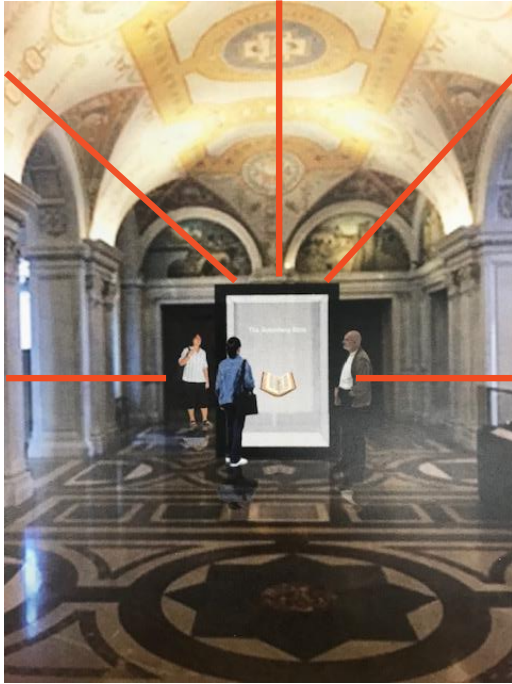
- New case requirements (a selection...)
- Controlled environment, similar to vault conditions (53° F and 50% RH)
- Removal of all electrical components from the air-stream
- Mechanical compartment to be separate from artifact chamber with different access privileges
- Fire protection / fire detection
- One-person access
- Ability to monitor environmental conditions in real time remotely
- Ability to dismantle and reassemble in different location
- Ability to show other treasures
- Constraints: Plumbing, data and power, and floor load
- Design considerations



New display case – Design considerations



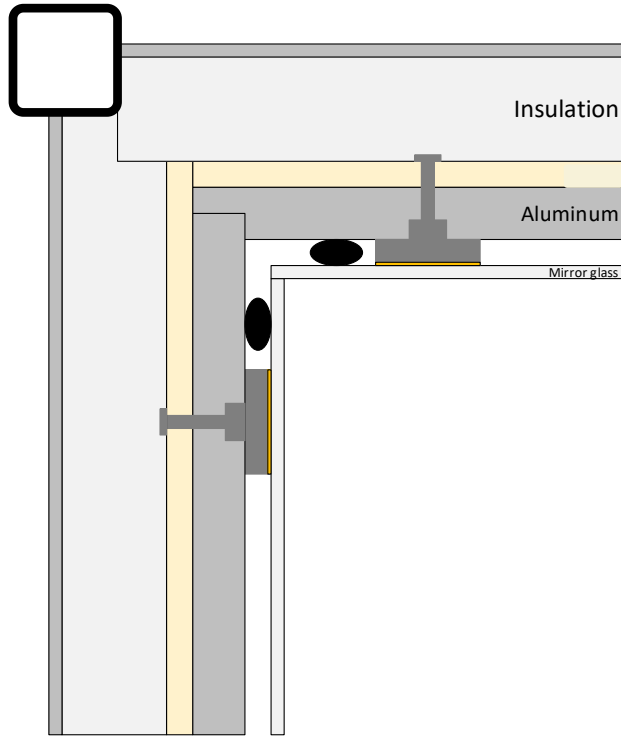
New display case – Design considerations



New display case – Installation



New display case – Wall Cross Cut



Inert framework/wall components

- Steel tubular framework
- Metal cladding (powder-coated)
- Insulation
- Impact resistant layer
- Aluminum
- Frosted glass mirror

Materials tested:

- Glass-to-aluminum mastic
- Gaskets

New display case – Installation



New display case – HVAC

Preservation Requirements

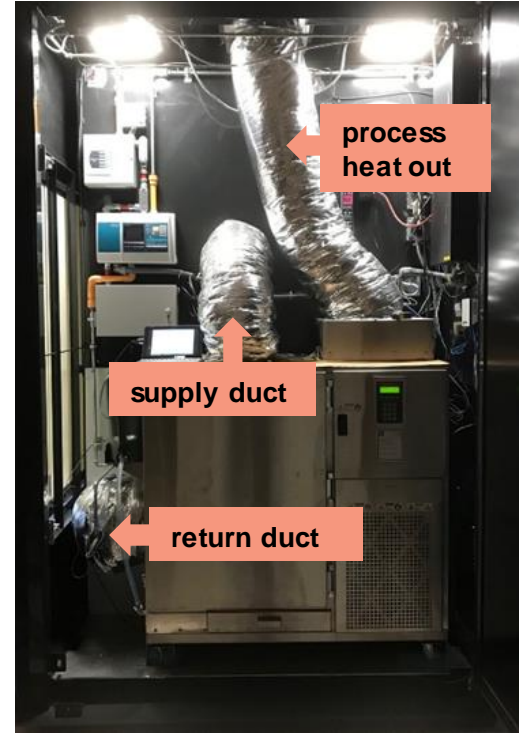
Ability to achieve and maintain stable conditions 53°F/ 50% RH

Self contained unit requiring no plumbing utility

Closed loop circulation to and from artifact chamber

Protection of the artifact chamber from heat build up from the unit

Isolate the artifact chamber from any portion of the mechanical unit that could generate smoke



New display case – HVAC

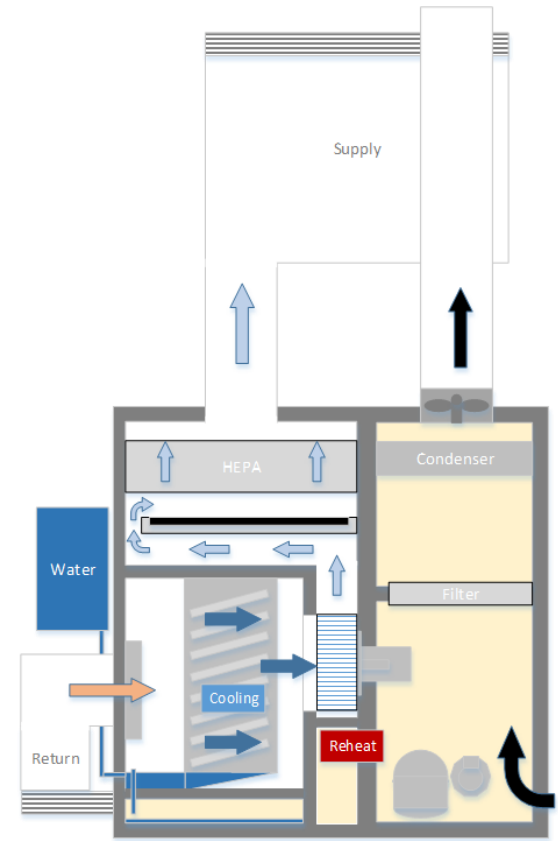
System Details

Air returns from the artifact chamber through the return ducts

Air passes over the cooling coils to achieve the correct moisture content or dew point control

Air is reheated to the programmed supply air temperature

The compressor and condenser located in the yellow area to left are segregated from the air supply to and returned from the artifact chamber



New display case – HVAC

Evaluating Materials

Very little fresh air enters the system. Any harmful pollutants at remain higher concentration

Heightened focus on selecting stable fabrication materials and testing to confirm impact on the bible

Additional testing beyond the traditional Oddy test tailored toward parchment



New display case— HVAC

Monitoring

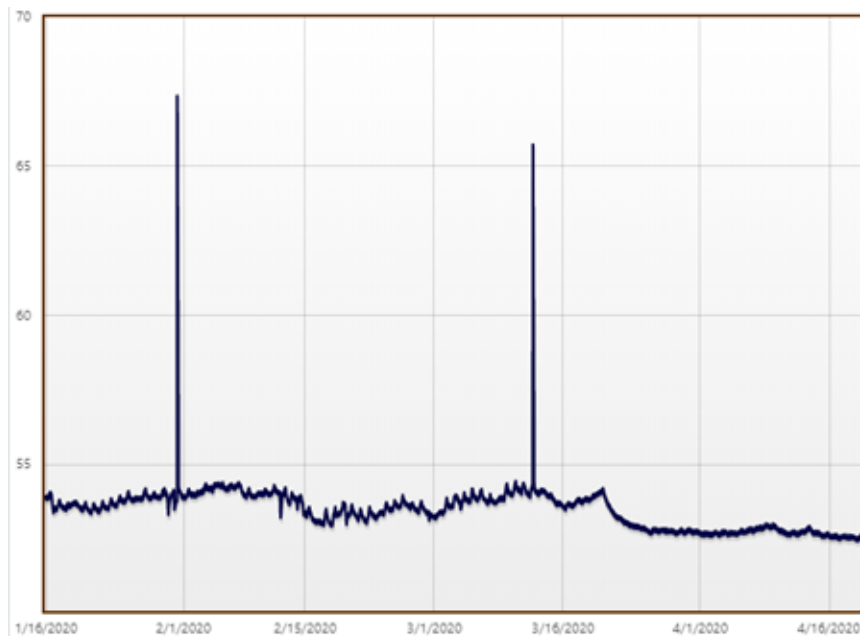
Devices in the supply and return ductwork monitor unit performance and artifact chamber conditions respectively

Rotronic's networked sensor probe (blue box) in the return duct provides real time conditions 24/7

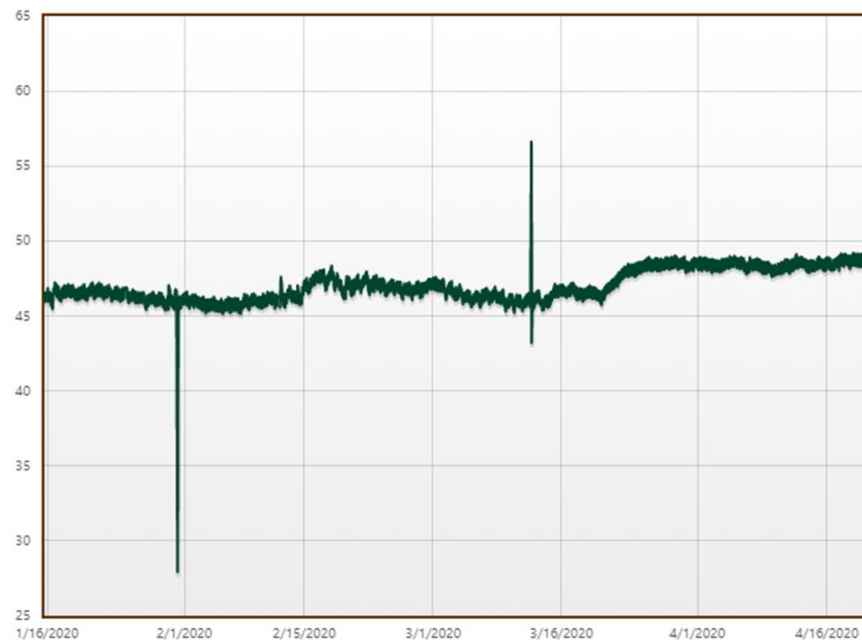
T & D sensor (red box) in the return allows us to check conditions should the network go down.



New display case – HVAC



TEMPERATURE 4 MONTH



RELATIVE HUMIDITY 4 MONTH

New display case – Fire Protection

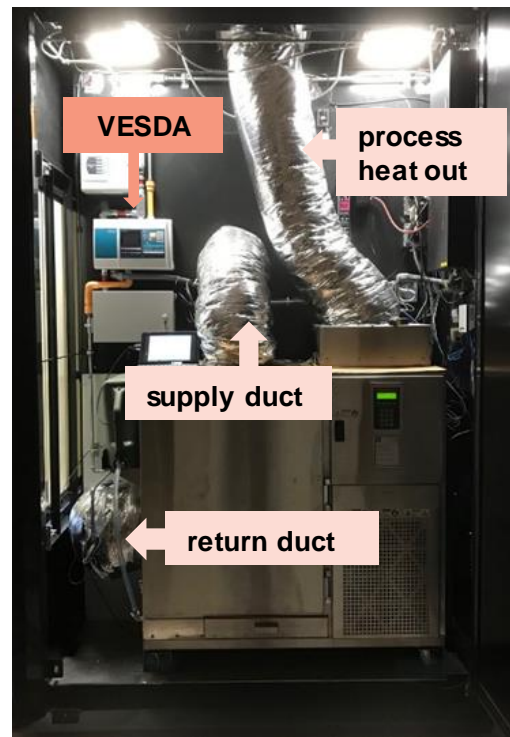
Preservation Requirements

Provide VESDA aspirating smoke detection in both artifact chamber and mechanical compartment

Provide sample ports for yearly system testing

Provide a physical barrier between the mechanical compartment and the artifact chamber to slow any potential fire spread

Isolate the artifact chamber from any portion of the mechanical unit that could generate smoke



Lessons learned

What works

- The HVAC unit achieves and consistently maintains environmental conditions
- Multiple devices record conditions and consistently provide data
- The case facilitates one-person access in case of an emergency

What needed tweaking

- Gasket joints
- Front door alignment to ensure proper seal
- Closing and locking mechanisms



Thank you!

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- Jake Nadal
- and Amelia Parks!



Questions?

You can ask us
preservation
questions at any time!

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